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ABSTRACT

This report of the Technical Assistance Study provided to the Smithville Public Schools by the Technology Lighthouse of the Merrimack Education Center offers information for use in planning computer technology applications over a 3-year period. It provides specific guidelines and criteria for planning and development, equipment considerations, software and courseware, training, program activities, and financial implications. Charts indicate 23 implementation steps for an organizational structure of grades K-2, 3-5, 6-8, and 9-12, and costs are projected for the 3-year period from July 1, 1983, to June 30, 1986. Issues addressed include appropriate applications for computers in the school program, the effect of the computer on curriculum, and the priority areas for implementing educational technology on the 3-year timetable. Eight specific recommendations are listed that relate to the hiring of a computer applications coordinator, purchase of a high school minicomputer, continued purchase of microcomputers, training considerations, software selection and exchange, administrative and special applications, a system-wide computer committee, and evaluation and updates. Preliminary planning steps outlined include establishing a planning committee, conducting staff awareness activites, developing educational philosophy and policies, documenting current computer-based activities, identifying resources, conducting awareness for key groups, and establishing priorities. (LMM)

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SMITHVILLE SCHOOL DISTRICT

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SMITHVILLE, MASSACHUSETTS

"A TECHNICAL ASSISTANCE REPORT" ON COMPUTER TECHNOLOGY APPLICATIONS

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ON
COMPUTER TECHNOLOGY APPLICATIONS

PREPARED BY:

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OCTOBER, 1983

SMITHVILLE SCHOOL BOARD

COMPUTER PLANNING GROUP

Smithville School District

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PREFACE

The Merrimack Education Center (MEC) is a regional education cooperative based in Chelmsford in the heart of the Merrimack Valley in northern Massachusetts. Established in 1965 to serve its twenty-two member districts, MEC has expanded its capabilities over the years to include a broad range of planning, curriculum development, evaluation and dissemination services. The guiding principle of MEC's development has been to provide effective leadership through flexible and responsive services.

MEC's efforts in technology applications in education are illustrations of that principle. Beginning with on-line information services and extending to computer-based instruction, MEC has worked in this area for nearly fifteen years. In 1977, MEC implemented a Computer Assisted Instruction program and today is one of five Lighthouse technology projects in the nation recognized by the U.S. Department of Education's National Diffusion Network as exemplary.

MEC's Technology Lighthouse is based on the rationale that schools need a comprehensive applications support system in order to make the most appropriate uses of computers and related interactive technologies. The Lighthouse support system has the following components. The first of these is planning. MEC staff work with local district teachers and administrators to analyze needs and capabilities in curriculum, training, hardware, courseware and support services.

Through its applications component the Lighthouse helps districts to design specific computer-based programs. An example is MEC's nationally validated CAI program, a comprehensive system which can be turn-keyed to district staff.

Finally, MEC provides several implementation support services, ranging from ad hoc consultation and trouble-shooting, to scheduled on-site monitoring and quality control.

The Technology Lighthouse is staffed by a team of experienced professionals to provide any and all of these services. Ad hoc teams can be formed to bring the most appropriate talent and experience to any task.

Through its Technology Lighthouse, MEC is helping teachers and administrators deal with exisitng interactive technologies, as well as anticipate and prepare for the near and distant future. New hardware and software tools--videodiscs, voice recognition, integrated courseware--all are nearly ready for application to education. The Lighthouse will help its clients identify new needs and opportunities, and meet the challenges of the technological future.

I

INTRODUCTION

In this report of the Technical Assistance Study provided to the Smithville Public Schools, information is offered in planning for the applications of computer technology over a three year period. This report offers specific guidelines in the areas of hardware, software, training, program activities and financial implications. Charts have been prepared indicating implementation steps based upon an organizational structure of K-2, 3-5, 6-8 and 9-12. Projected costs have also been determined over a three year period based upon the suggested computer applications.

Any plan or forecast, especially in the area of rapidly changing technology, must be reviewed periodically with necessary revisions or modifications. It is suggested that the recommendations being outlined in this report be reviewed on 6 month intervals by the administration for any changes that might be appropriate.

The three year cycle in this report covers the period of July 1, 1983 through June 30, 1986. Some of the recommendations are receiving early implementation (June, 1983) based upon information provided in the Interim Report submitted to the school system on June 1, 1983. The Smithville School System is to be complimented on the steps it has taken in a short period of time to update the school system capacity to apply technology in all its schools. These efforts began in earnest in early

1982 through a number of steps that included training, purchase of equipment, and studies such as the technical assistance contract completed by the Merrimack Education Center in the attached report.

As we review Smithville's steps in the application of computer technology we should think of it as an evolutionary process that proceeds in phases. In the first phase the schools are tooling up with hardware, software and early computer training at all levels. The second phase finds the schools involved to a greater extent in the planning process as it relates to goals, defining competencies and integrating computer programs with the curriculum.

The proper integration of computer technology with the instructional processes can lead to at least two important benefits.

1. We can and should save time in doing what we can now do in our regular ongoing school programs--time that can be used to emphasize the problem solving and thinking skills students need to live in a technological age.

2. We can get greater student gains in present instructional outcomes using computers to increase feedback and customize programs to the needs of students. Very few educators today maintain the view that computers are just another fad. For the vast majority, the question is no longer whether to use computers in our programs, but how.

II

BACKGROUND

Several assumptions are set forth to define the perspective of this study:

1. Computer technology is penetrating every aspect of our lives--homes, industry and offices.

2. By the turn of the century millions of jobs will involve laser technology, robotics and other interactive technologies.

3. Technology is radically transforming a host of occupations including health care, energy production, food processing, printing of books and newspapers, construction and building trades, repair and maintenance of sophisticated industrial equipment.

The ability to function in a computer and technology oriented society, in short, to be computer literate, is a goal of the Smithville School District for all graduates--not for some future society, but for today. Technology in the 1980s will have an impact of great consequence on education. The following statement from the U.S. Department of Education emphasizes this need for technology instruction in the schools.

> There is a widespread agreement that the use of educational computers has the potential to alter profoundly and improve the quality of instruction and learning at all levels of education.

This need for technological literacy is especially great in Massachusetts. New England has 11% of the nation's high technology employment and high technology firms employ 28% of the region's total manufacturing work force. Over half of the New England personnel

employed in high technology live and work in Massachusetts. This rapid growth of technology has benefited from the electronics industry, especially computers, in Massachusetts and has continued through the 80's despite lags in production felt in other sectors of the economy.

However, high technology is still "people poor" lacking the necessary manpower skilled for employment. Our present day economy needs technically educated and motivated young people willing to seek advanced education in science, math and engineering. Currently, some of these career fields have a surplus of jobs and a scarcity of trained personnel. The high schools can begin to meet this need by offering a full curriculum for computer science education and computer mathematics as well as business education using latest electronic technologies to prepare students for going on to technical schools or engineering, and for entry-level skills and employability. For that reason, there is a need to study the possibilities, problems, concerns and issues that this technology brings to education. To understand what these machines are and what they can do, and to be able to work effectively with a computer when necessary, is becoming increasingly important for the school program.

III

PURPOSE OF THE STUDY

From a number of discussions with individuals and groups, common issues have arisen that deserve consideration in this report. While the list of issues presented here is by no means complete, these topics have been named in the Smithville schools and, indeed, in most other school sytems as they move into computer applications within the schools.

The present study was prepared to suggest guidelines and criteria for selecting instructional technology for classroom and administrative applications--including both hardware and software recommendations. In preparing this study, we have asked several questions:

1. What are the appropriate applications for computers in the instructional program?
2. What effect does the computer have on curriculum?
3. What are the priority areas for implementing educational technology on a three year time table?

Additional Questions and Concerns

A. What does it mean to be computer literate?

Computer literacy is whatever computer knowledge, understanding and skill development one needs to function effectively in society. A computer literate person would have awareness of computers, knowledge and understanding about computers, and skills in using computers as problem solving tools and as creative instruments to enhance communication.

B. Will computer literacy create a "have or have not" disparity in our schools?

Computer literacy can provide "information power" for those who are competent with computers. "In an information age" those who can gather, store, transform, retrieve and dispense information appropriately will have enormous power. Economic disparities that exist now, both in and between various cultures will be widened with assistance from computers. In developing a policy for computer literacy, we should make provisions for equal access and opportunity from all social and economic groups. The students that have computers at home right now have a huge advantage over those that don't have them.

Many administrative policies affect access to computers. Locating computers within the schools either in lab situations or within the school classroom must be examined with regard to accessibility and "equal" time. Even in the classroom, if they are used as rewards for students who have finished their work ahead of others, certain students are likely to become among the have nots.

C. Who should decide about computer literacy and computer applications?

Many computer programs are started by the enthusiasm of a single individual or a small group of individuals in a school system. These people tend to be math and science teachers. Without taking away from the obvious contributions that these teachers made to the early implementation of technology, it is recommended that the base for decision making about computers be widened greatly. Students, parents, teachers, and administrators can participate in computer advisory committees to consider issues and make recommendations. Computer applications are becoming wide-spread across many academic and management areas, making it impossible to maintain the view that computers are best used only in the math and science area.

D. How can administrators effectively lead the development and application of computers in their schools?

School improvement of any kind is best undertaken when administrators are actively engaged in modeling the desired behaviors that lead to desired outcomes. Administrators can lead the charge by applying computers to increase their own effectiveness. Here are some obvious applications.

1. Word processing to increase volume and reduce time spent in documenting information in preparing reports and written communications.

2. Keeping personnel/student data in a systematically organized data base that allows for updates, summaries and various reports with options.

3. Class scheduling and attendance reporting.

4. Utilizing computers to increase effective use of personal time through daily "do lists", delegation plans and time scheduling.

IV

RECOMMENDATIONS

Much has been accomplished by the Smithville Public Schools in the applications of computer technology. The following recommendations are presented to further advance these efforts but, equally important, to sustain and optimize the capacity that has been developed.

1. COMPUTER APPLICATIONS COORDINATOR

A new position entitled Coordinator of Computer applications is being considered for the school system. This position may prove valuable in coordinating the many computer requirements and also assist in the very necessary integration of computer technology with the curriculum. This position will report to the Assistant Superintendent of Schools and will also include a major responsibility for the design of inservice education for the application of computers. A job description with qualifications, reporting responsibilities, job goals and performance responsibilities is located in the Appendix to this report.

2. HIGH SCHOOL MINI COMPUTER PROPOSAL

The present computer capacities at the High School have served the school system well over the years. School system personnel assigned at the secondary level in data processing are performing as magicians in keeping the equipment operational. It is recommended that a proposal be developed for the contributions committee of selected computer corporations. This proposal should request contribution allowances of approximately 50% towards the purchase of a mini-computer. The proposal should outline current use of computers in Smithville and how a new system at the High School would complement existing endeavors. It is suggested that languages include BASIC, COBOL and PASCAL. In budget deliberations, it is important that consideration be given to maintenance requirements, staffing requirements and software

requirements in connection with the purchase of the minicomputer. Merrimack Education Center is prepared to assist in that regard.

3. CONTINUED PURCHASE OF MICROCOMPUTER

Smithville began the purchase of microcomputers in the Fall of 1982. It is recommended in this report that additional microcomputers be purchased in order to establish computer labs at each of the school facilities. It is also recommended over a three year period that classrooms be equipped with one or two computers. Cost estimates are indicated in budget information enclosed with this Final Report. The computers should have a minimum of 64K capacity, color monitors, disk drives, graphics printers in a lab situation of 12 micro-computers at each of the elementary schools. Should additional funds be made available, microcomputers can be considered for grades 7 and 8 and also for a lab situation at the High School until a mini computer system is established at that level. It is important to recognize that initial set ups of microcomputers may vary in subsequent years as new equipment is purchased and K-12 programs are implemented.

4. TRAINING CONSIDERATIONS

The effective utilization of computers will be dependent upon the staff and their knowledge, attitudes and skills in this area. It is recommended that training be customized to the various grades and/or subject levels. A three-level instructional computing inservice model is made part of this report. All staff should receive, as a minimum, training at Level 1. Level 2 and 3 training will be more specialized and offered for appropriate staff. One model currently being implemented in Smithville is training a local staff member as a trainer (software specialist). This person can then teach teachers locally at less cost through local inservice programs. The application of computers in the schools like other innovations requires careful consideration, study, analysis and integration with existing instructional and administrative systems. Teachers will be the "humanizers" necessary for the effective use of technology for learning. Factors that need consideration include facilitating and understanding change, using resources effectively, providing support systems,

overcoming inequities through equalization of resources, and communication in policy issues, needs and community level views. The school system central administration should establish as a high priority the review of all computer technology applications as they impact on the school improvement process.

5. SOFTWARE SELECTION & EXCHANGE

One of the additional measures that will contribute to effective computer utilization will be in locating quality software. Currently the computer applications coordinator, the software specialist (trainer), mediaspecialist and librarians represent resources that can assist in selection, evaluation and distribution. It is recommended that efforts in this area be limited at this time to evaluation and not expand to include development until a later date and only then if it becomes feasible.

6. ADMINISTRATIVE & SPECIAL APPLICATIONS

Although the major emphasis of this study is in the instructional area it is important to recognize that administrative and support areas (special education, libraries, guidance, business, etc.) can also benefit from the utilization of computer technology. It is recommended that microcomputers be made available in those areas on a needs basis. Mini-proposals from these respective areas would be requested by the central administration. Mini-proposals would spell out purpose, objectives, rationale, activities and expected gains. An example of an area that might qualify would be in IEP management.

7. SYSTEM-WIDE COMPUTER COMMITTEE

Building on the work of the previous K-8 committee on computers, it is recommended that a system-wide committee (K-12) be established. It is suggested that it be organized by planning areas such as courseware, staff development and the like. These sub-groups would meet as needed and the coordinating committee would meet on a more regular basis. As the school system gains expertise in the application of technology, the role of committees will increase in value especially as it relates to the area of curriculum integration.

The K-12 computer advisory committee could include parents, teachers, administrators, and community representatives who can participate and consider issues and make recommendations to the administration. It is recommended that plans for the formation of this committee begin as soon as possible and a specific charge be developed for them by the school committee and the central administration. This committee should also be of great assistance to the new computer application coordinator.

Schools have a long standing relationship with the home and have fostered many programs with parents that are designed to improve communications and assist the children in the learning environment. Recently, with the home market for computers expanding, schools are in the position of advising educationally and pedagogically, in the area of software. Compatibility of software between home and school will become a central question. It is recommended that schools initiate computer awareness programs for the home and the community periodically through public information. This public information support can be planned by the committee. Individuals representing the community can also serve on the committee. The exchange of information on computer hardware and software will be beneficial to both home and school.

8. EVALUATION & UPDATE

It is recommended that this study and various steps that are implemented as a result of this study be reviewed periodically. Rapid changing technologies suggest that progress reports be issued on a 6-month basis. It is also recommended that many efforts both in the labs and in the classroom will require documentation for purposes of review and evaluation. Pilot endeavors should be encouraged and the results shared throughout the Smithville School System.

V

IMPLEMENTATION STEPS

To carry out these recommendations, the following implementation steps are provided on a three-year timetable.

Year One

- Establish system-wide computer committee (K-12), prepare planning agenda and schedule first meeting for September, 1983.
- Continue purchasing of microcomputers ($1,500 to $2,000 range) to complete laboratories in each of the school facilities. Each lab, when complete, will have 12 microcomputers or a ratio of 2 students for each computer.
- Post new position for computer applications coordinator and select applicant for September 1983 appointment.
- Train additional staff at the High School level in the teaching of PASCAL.
- Conduct workshop in software evaluation using local instructor trained by the Merrimack Education Center Software Leadership Institute.
- Establish a small software library (100 diskettes with support documentation) for use in computer laboratories for the Fall. Establish central distribution center in this area.
- Purchase 5 professional computers at the High School level for utilization of the math/science departments.
- Schedule Level I computer literacy training for all staff through regular inservice education programs.

Year Two

- Develop specifications for minicomputer system (CPU, etc.) for the High School. Plan for two laboratory arrangements of 12 terminals in each. Minicomputers will be used for scheduling, attendance, report cards and also serve the laboratories in the teaching of programming languages (BASIC, COBOL, PASCAL).
- Develop proposal for Contribution Committees of large computer corporations.

- Add 14 stations (word processing laboratory) to the Business Education Department at the High School.

- Purchase portable computers for K-2 level classrooms (two per classroom--under $1,000.)

- Initiate purchasing of microcomputers for classrooms (one or two per classroom.)

- Request miniproposals from offices and departments (administration, guidance, special education, etc.) relative to administrative use of micros. Locate microcomputers in offices where successful proposals are received.

- Recommend that the software committees expand libraries of software at the levels of 3-5, 6-8 and 9-12.

- Continue Level I training on computer literacy and initiate special programs in inservice education at Level II.

- Conduct annually a home/school computer awareness program. This would be a home/school program that would involve all levels of the school system.

Year Three

- Continue purchasing of microcomputers at the elementary school level grade 3-5 for classroom purposes (1 or 2 per classroom).

- Continue purchasing of microcomputers at the High School level and locate microcomputers in various departments for specialized use. It is recommended that 2 or 3 micros be located in each department primarily for curriculum purposes.

- Initiate maintenance contract on new minicomputer.

- Continue mini-proposal plan to add microcomputers to various administrative and special purpose situations. These will be provided to areas such as guidance, special education, athletics, and the like. These proposals will be reviewed for successful applications and up to five microcomputers would be made available.

- Continued expansion of Software Library for school system based upon utilization of selection criteria and testing of software before purchase.

- Inservice education programs would be expanded to include Level III training in the utilization of computer technology with special emphasis on integration of technology with the curriculum.

VI

PLANNING AND DEVELOPMENT

This report is designed to provide preliminary information for purposes of budget planning and, also, serve as a progress report of the study committee meetings. The following activities, undertaken as part of this Technical Assistance study, were carried out to gather the information, opinions and knowledge required to plan for the future.

Planning Activities

A. Information Reviewed from the Superintendent of Schools and Other Members of the Central Administration Staff

A schedule was prepared that enabled Merrimack Education Center to review a number of materials that have been developed either by the Smithville School System or for the Smithville School System with regard to the utilization of computers. Those reports have included the Merrimack Education Center Computer Literacy Training Report, Computer Progress Reports to the School Committee, Summary Report of the Computer Study Committee and other working documents completed by various committees. Other materials reviewed included information relative to hardware and software and various school system planning documents such as organization charts, enrollment studies and school board minutes.

B. Meetings Attended

A number of meetings and on-site visits were conducted in the early months of the study. These included visits to the Computer Literacy Sessions held within the Smithville Public Schools on a released day when teachers and administrators had the opportunity to operate Apple microcomputers and to observe some of the software that was available. Subsequent meetings were held with the administration, and the Smithville Computer Advisory Committee . Meetings were also held with the Assistant Superintendent and the Business Manager. An on-site visit was made to the High School where personnel from the High School administration, data processing department, business education department, math department and High School library reported on present capacity and future needs. One additional meeting was held with principals of the various schools relative to their perspectives on the utilization of computers within their school facilities.

C. Literature Reviewed

Merrimack Education Center has completed a review (via computer searching techniques) of various documents, monographs and research material on the implementation of computers in education. These documents were reviewed for the application of proposed models to education, especially as it relates to the

Smithville Public Schools. The State Department of Education and local schools were also contacted relative to efforts that are underway in the area of computer education environments.

Most districts have undertaken some staff awareness and explored a few classroom applications, but many have yet to undertake the serious planning and development that distinguish a comprehensive program from fragmented, piecemeal tinkering. There is more readiness now to move from experimentation to program development, to build upon the experiences gained thus far in order to create meaningful educational applications of interactive technologies.

The Smithville Schools have made a major commitment to the goals of computer literacy. The planning and development suggestions presented on the following pages highlight the possibilities, problems, issues and concerns that this technology brings to education. The needs for computer literacy as well as the use of the computer as an instructional aid and an administrative tool must be examined. The mission is to increase participation of students in computer awareness and computer literacy and to increase the number of students who can participate in the different grade levels.

The planning and development process can be viewed as having five overlapping stages that need to be repeated at regular intervals over a multi-year period. The five stages are:

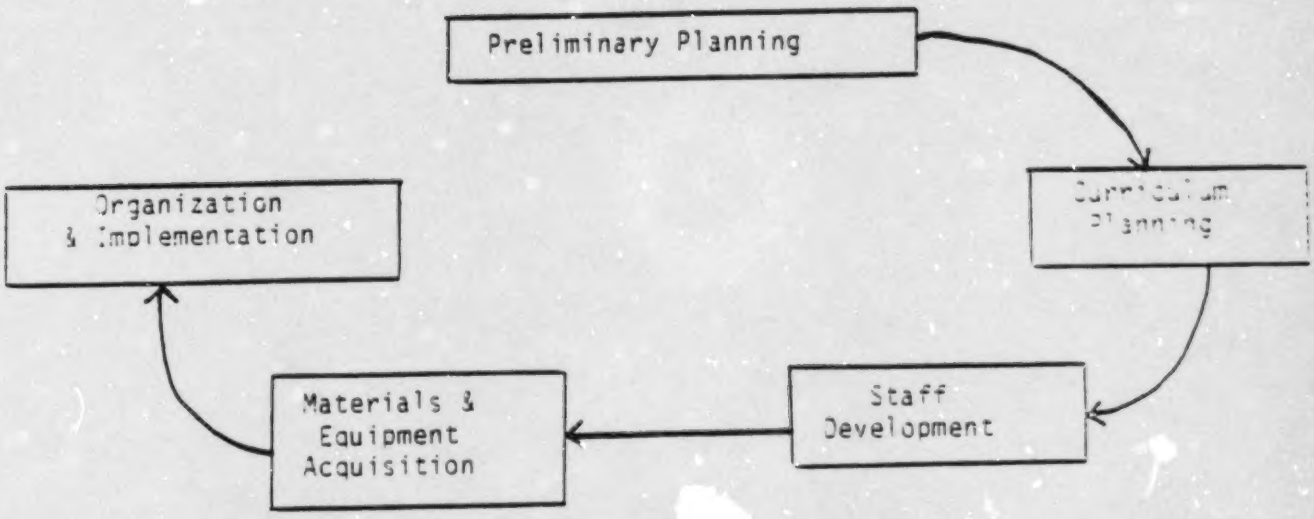
1. Preliminary planning.
2. Curriculum planning.
3. Staff development.
4. Instructional materials and equipment acquisition.
5. Organization and implementation.

Preparation is everything (or nearly so) in implementing computer education in schools. The first stage of the process is essentially pre-planning, or preliminary planning. Before committees start detailed curriculum planning, there are several preliminary activities that need to be conducted:

What Needs to be Accomplished:

- Developing a planning structure and process.
- Establishing a broad sense of direction.
- Gaining support and commitment from key groups.

FIGURE 1
PRELIMINARY PLANNING



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Establishing System-Wide Planning Committee(s)

It is recommended that a system-wide committee K-12 be established that is widened from the present K-8 committee. The K-12 computer advisory committee should include parents, teachers, administrators, who can participate and consider issues and make recommendations to the administration. It is recommended that plans for the formation of this committee begin as soon as possible and a specific charge be developed for them by the central administration. This committee should also be of great assistance to the new computer application coordinator.

Merrimack Education Center is encouraging school districts to step back and take a comprehensive look at the tasks. It is important that the total program be viewed, not just the components. To accomplish the comprehensive view and perspective for educational technologies, it is recommended that the planning committee be charged with specific tasks. There are several ways in which the committee might be organized: by broad grade levels (elementary, junior high/middle, secondary); by subject matter areas; by planning areas (courseware, hardware, staff development, etc.). We recommend the latter because it fosters multidisciplinary involvement. In Figure 2 is an example of a committee structure using planning areas is an organizational framework.

FIGURE 2

TECHNOLOGY APPLICATIONS PLANNING COMMITTEE

• Assistant Superintendent for Curriculum and Instruction • Computer Applicaton Coordinator			
Curriculum Sub-Committee	Staff Development Sub-Committee	Materials & Equipment Sub-Committee	Organization & Implementation Sub-Committee

In this sample structure, the committee is composed of six members: the assistant superintendent, the computer applications coordinator, and the chairpersons of the four sub-committees. Each of the sub-committees is composed of faculty and other resource people (e.g., consultants, community members, parents). While all of the people involved may meet collectively only once or twice, the individual sub-committees and the coordinating committee would meet regularly and frequently to accomplish the actual work and tasks. The advantage of this particular structure is that many faculty can be involved while maintaining focus on a specific area. This organization requires good communication among coordinating committee members.

Consideration must be given to the relationship of these ongoing committees with regard to the tasks and responsibilities assigned to staff. Committee work must be integrated in such a way that the results of these efforts are directed to students on a K-12 system wide basis. The information currently available on technology, whether it be in the area of hardware, software or training, tends to be fragmented at best. The synthesizing of this information, the effective use of resources and the articulation of this curriculum and technology on a K-12 basis requires system-wide efforts. Advice and decisions are needed at all levels, the administrative level, the teaching level and the instructional level. When properly established, system-wide committees can bring interaction through group participation while they focus on specific issues and recommendations for the improved applications of technology. Committees provide the capacity to link the goals of the program directly to the teaching/learning environment.

One of the major tasks for the district wide committee will be that of working on a model for goals in the school system as they relate to K-12 computer applications and curriculum integration. The outline and sequence of activities developed by Merrimack Education Center, and shown in a later section of this report, includes grade level activities and computer education sequences made available for the work of this committee. These charts can serve as a starting point for the work of the committee to expand the options for computer literacy in an integrated curriculum.

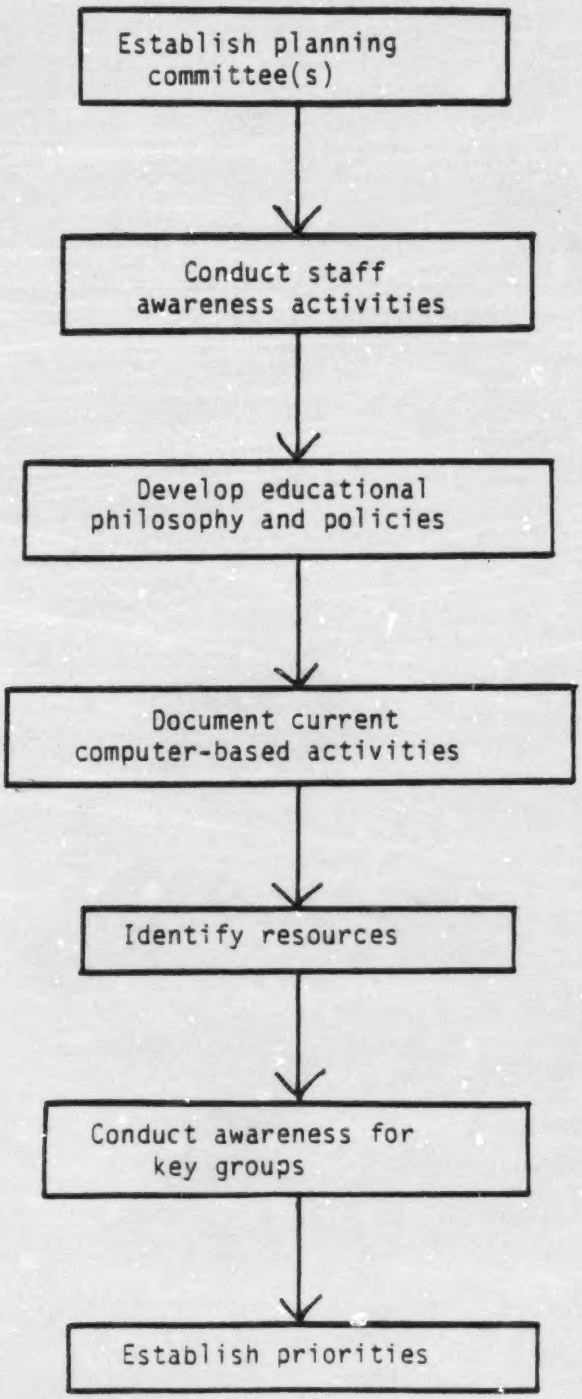
The application of interactive technology provides an opportunity to review our educational goals and objectives. It requires participation and cooperation by staff and committees in facilitating change, increasing resources, delivering resources, overcoming inequities and increasing communication.

When applying interactive technologies to the school improvement process, efforts are designed to bring about positively valued changes in student learning outcomes, in teacher skills and attitudes and in institutional functioning. The application of computers in the schools, like other innovations, requires careful consideration, study, analysis and integration with existing instructional and administrative systems. These include: school self review--the role of the principals, the role of support structures, evaluation of school improvement processes and the implementation of policies.

With the technology changing so rapidly, it may be necessary to repeat this sequence of stages several times over the next five to ten years. Any plan or forecast, especially in the area of rapidly changing technology, should be reviewed on 6 month intervals for any changes that might be appropriate. Figure 3 illustrates these preliminary planning activities and suggests that the school district document current computer activities and monitor progress as these applications are developed. This process of implementing steps is shown in the illustration in Figure 3.

FIGURE 3

WHAT TO DO: PRELIMINARY PLANNING ACTIVITIES



Develop Educational Philosophy and Policies

One of the tasks for the committee, working with the central administration and the coordinator for computer applications district-wide, is to develop the statement of philosophy. This statement should delineate the rationale for using technology in the schools, including assumptions about the future, and the mission of the schools with respect to technology. The philosophy should also address critical issues with respect to the use of technology in education, such as equitable access, programmatic priorities, and goals.

Policies are required to guide the allocation of planning and development resources. Some areas in which policies may be needed are:

- Organization and staffing
- Staff development
- Program emphasis (grade levels, subject aras)
- Curriculum

VII

EQUIPMENT CONSIDERATIONS

From information gathered and meetings attended and documents studied, a number of considerations are forthcoming with regard to the application of technology and equipment requirements. In Smithville, through foresight on the part of school administration, a number of key staff members were enrolled in computer awareness training that enabled the development of expertise that could be utilized to assist in the planning and selection of equipment. This training and selection process led to the leasing of Apple computers for instructional purposes. This decision was based primarily on the availability of instructional software, which gave the Apple computer early advantage over other makes of equipment. In considering additional equipment for Smithville, some of the deliberations revolve around compatibility with existing equipment, available software, obsolescence, new advancements in equipment, configurations of equipment within school buildings (units per building/units per student) and networking. Other considerations include the logistics of monitoring the use of equipment, repair/maintenance and secur[illegible]

Efforts in equipment selection in Smithville involve a separate set of factors at the secondary level. The High School equipment has been in use since the early 1970's when a Wang 2400 was purchased for scheduling, attendance and grade reporting. Some additional data processing and word

processing equipment was made available at the Business Department and Mathematics Department. Equipment needs are being given careful consideration in regard to the instructional and administrative program areas. The current equipment at the High School has served Smithville well, and some may have earned its retirement. Cost considerations, however, are important in regard to replacement, enhancements and new configurations.

The Smithville School System should give consideration to computer based programs using a model that incorporates three levels of application: K-2, 3-8 and grades 9-12. Hardware selection in these respective areas will be as follows: K-2 (computers under $1,000), grades 3-8 (computers in the range of $1,000 to $3,000), and grades 9-12 (a combination of microcomputers and a mini-computer system with necessary peripherals).

Other Considerations

(a) Should we buy now or wait for the next improvement in hardware/software?

No one wants to buy obsolete equipment, software or courseware; yet, in view of today's volatile and rapid market growth, most of these items are somewhat if not completely obsolete the day that they are put on the market. How can we then justify the purchase of obsolescence? If you can presently justify the use of existing state-of-the-art computers for at least one major purpose, buy them. Don't over-spend or over-buy, but don't delay. You will never learn how to utilize computers without accumulating experience with them. The skills learned on one machine should be easily and readily transferred to learning a second or third machine. Many of the best practitioners today started applying computers to educational problems back in the 60's with equipment and software that now no longer exists; yet, their experience is far from being obsolete and will transfer to

a new generation of technology. It is far more important to know how and why to use computers than to have the latest computer at any given time.

(b) What kinds of computers should we buy?

This question is asked more often than any other. To answer it we must answer other questions first; e.g., What computer literacy skills do you want students to obtain? What activities will be carried out with what software? How many computers do you need for students to obtain these skills? What graphics or printing capabilities will help to best deliver instruction? What are the equipment needs and peripheral devices needed in each location? What will be the software requirements? Answers to these and other questions have begun to emerge as to what computer is needed now.

Essentially, there are three types of computers that will be useful to the schools in the next several years.

- The first type is the low cost portable microcomputer ($200 to $800) that can be dedicated to teaching about computers, limited CAI, and simple BASIC programming.
- The second type is the larger, less-easily portable microcomputer ($1,000 to $2,500), the personal on-desk type computer that is now used in many classrooms to deliver CAI and CMI requirements. It has larger memory and screen graphics.
- The third type is a higher speed, higher capacity minicomputer system with central, hard disk storage to deliver large-scale comprehensive instructional activities for many students at once and, in addition, has enough capacity to handle the entire school information management processes.

In other words there is no one right computer that can efficiently satisfy all these needs. As Smithville purchases a single type of computer they will meet certain needs quite well and at the same time they may find that additional types of equipment are necessary to meet other needs. Differentiated purchasing seems to be the answer, once outcomes have been well defined.

(c) What should we do when we find that little of the available software/courseware fits our needs?

The issue is the same as that faced by educators in the purchase of textbooks and other materials. Much of what has been prepared by authors and publishers does not adequately address all the local needs. Furthermore, current courseware can only replace, augment, or extend existing instructional materials and activities. If school systems hope that a single approach to math or reading by a publisher of software will allow for a complete replacement of existing materials then that school faculty will be prepared for a disappointment. However, if you can see how the electronic materials can augment other materials as one option to help students to learn better, then a great deal more will be accomplished.

Maintenance. Smithville's inventory of microcomputers may eventually grow to levels of 150 to 200 in number. Cost of maintenance can approximate 20 to 30 thousand dollars in this regard. One alternative that the school system might explore is to utilize high school students who would be trained to provide minimal type maintenance service. Other alternatives include outside contracting to companies and agencies that can provide this service.

Security. This is a subject often overlooked until too late. Through the wide variety of equipment available, there is also a wide variety of security risk. Some computer systems are so small they can be concealed by a school bag or at most an attache case. Others are so cumbersome that they are inherently more secure. Responsibility must be established for security of the entire system. Not only must the computer system be controlled but also maintained. An individual or department must be assigned the responsibility for insuring security of hardware, software and documentation. This means that they must be familiar with proper data processing techniques such as backing up software, data and keeping archive records if necessary.

VIII

TRAINING

The Smithville school system is to be complimented on the steps it has taken in a short period of time to update the school system capacity to apply technology in the schools. Just as the planning stages need to be reviewed on an ongoing basis, the need for staff, and equally important, the necessary training or retraining required for that staff to meet the emerging needs of the school department, must be reviewed as well. This factor has been recognized by the Smithville Schools in attending the MEC Computer Literacy Training Program and conducting their own training in cooperation with UNICOM, Inc.

The purpose of initial staff awareness sessions is to introduce the faculty to interactive technologies and prepare them to conduct the detailed planning and development necessary for a comprehensive program and curriculum integration. It is not a requirement that all teachers become expert in using computer programming in order to lead discussion in computer awareness or skills for their pupils. In-service will be performed to ensure sufficient teacher skills to present effective instruction in curriculum areas. A suggested list of topics for introductory sessions, to help develop computer literacy on the part of faculty, would be as follows:

- Technology Applications in Education: Today and Tomorrow
- Computers: A Technical Overview

- Courseware and General Purpose Software
- Implications of Computers and Related Technologies for Curriculum, Staff Development and Organization
- Future Applications of Computers in Our District: An Overview and Discussion

What about training and retraining of educational personnel?

As the methodologies and technologies of education accessibility are expanded there will be a need for the redefinition of traditional practioner roles. Teachers will become specialists who diagnose, prescribe and supplement the individual's educational needs. Preparation of the teaching activity will require skills of computer literacy and similar changes will be observed in the preparation of school administrators, counselors and other educational specialists. Three levels of in-service have been identified in preparing the personnel needed for utilizing technology in the Smithville Public Schools. (See Figure 4.)

There will also be an increased emphasis on sequential curriculum development and matching of instructional activities to the psychosocial/social and developmental levels of the learner. Teachers will be the "humanizers" necessary for the effective use of technology for learning. Preparation of the teaching activity will require great integration of skills in both the cognitive and affective areas. Similar changes will be observed in the preparation of school administrators, counselors and other educational specialists.

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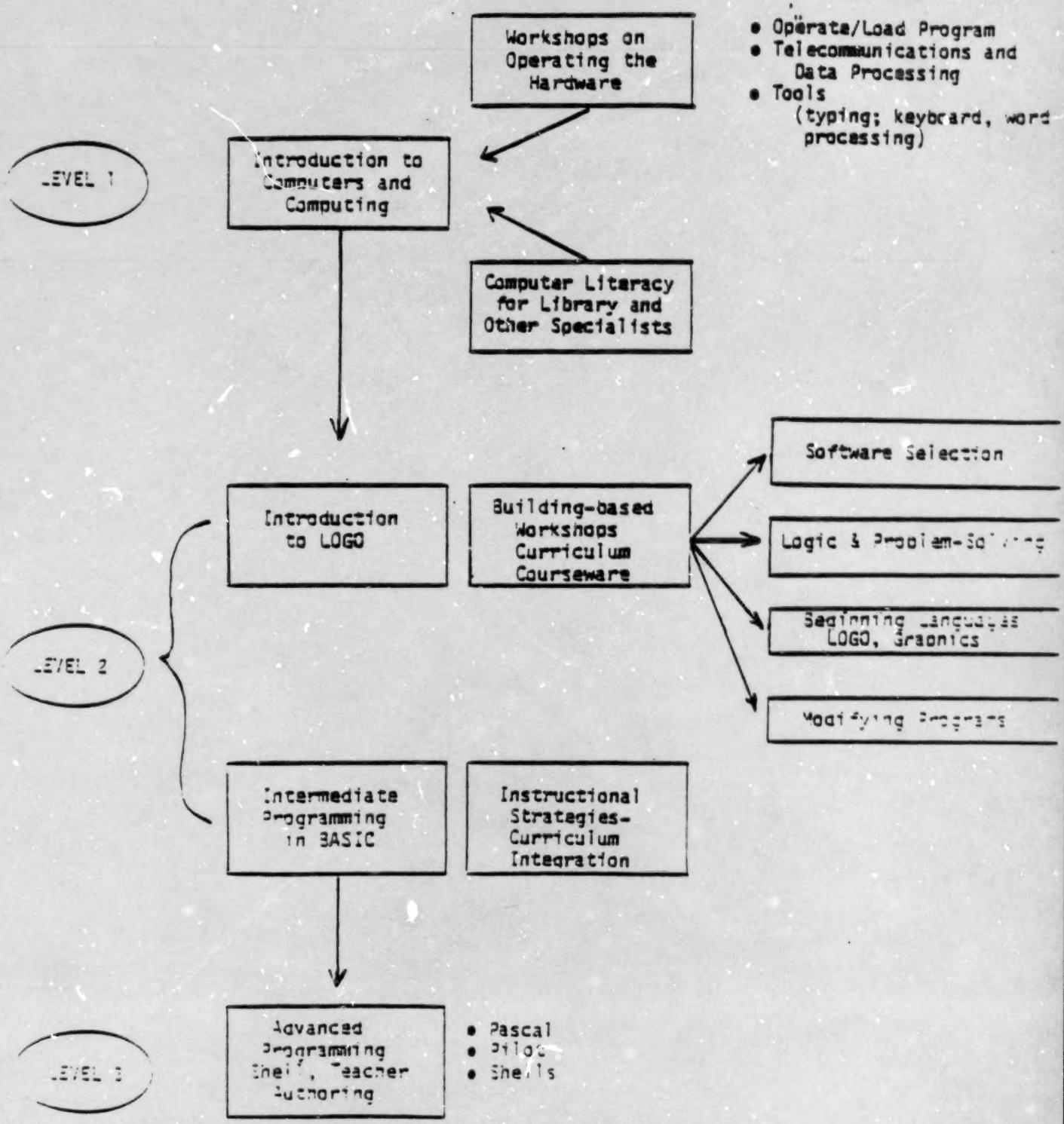
FIGURE 4

INSTRUCTIONAL COMPUTING

INSERVICE



For each teacher in the school district, we are recommending a Level I introductory course and for many teachers a Level II demonstration and applications course. Further staff development needs will be identified as the general curriculum framework is developed and can be provided for. Specific building level workshops or department workshops and seminars can be planned to integrate software into the curriculum.

For those individuals who will be using the computers in the classroom during 1983-1984, a sixteen to twenty hour in-service course, which has a computer literacy component, along with complete familiarity of the computer that will be used is recommended. Programming is not necessarily included in this in-service. The in-service should present to teachers the elements of what makes a good instructional program. Perhaps only twenty percent of the faculty will complete all the levels of computer literacy, through computer programming, defined here.

In the final report of the computer committee, an excellent list of recommendations was prepared for the training area. One of those recommendations was more indepth training, and more emphasis on the selection and usage of software. The Smithville school system already has a person who completed the advanced software institute at the Merrimack Education Center and can serve as a school based trainer in this regard. Extension of these skills to other staff in the system will require more inservice education programs. This report recommends that Level 3 staff development programs be established in the near future. In particular, faculty at the secondary school level can receive training in PASCAL and in the teaching of advanced data structures.

Some of the additional considerations in the training and retraining of staff are training costs, training resources, the appropriateness of training and the use of technology in the delivery of training. Clearly staff development is a vehicle for helping schools implement technology in the areas of instruction and administration.

IX

SOFTWARE AND COURSEWARE

One of the major sub-committees recommended in the planning section is in the area of software selection and distribution. A new position as system-wide computer coordinator has been approved and a job description has been prepared relative to this title, qualifications, job goal and performance responsibilities. (See Appendix A.) This position will greatly enable the Smithville Public Schools to offer more staff development inservice and to coordinate computer applications in the individual schools.

As we begin to look at initial ventures in the application of educational technology, we need to focus on pedagogy as well as technology, on curriculum and instruction as well as hardware and courseware. The advent of microcomputer technology affords the opportunity to do things in our instructional programs that we couldn't do before. Whatever our uses of the computer, as a tutor, a tutee, or a tool, we need to increase effectiveness and productivity.

The media and instructional materials staff have acted informally as a source of reference and journal reviews on software. In establishing criteria for the selection of software, planners are required to make decisions in the process that are not in isolation. Without knowledge, understanding and documentation of the existing curriculum within schools

the selection of software and courseware will indeed be difficult. Consideration must be given to the multiple criteria necessary in the selection and utilization of software for the educational system. Good software selection requires an understanding of evaluation and the development process. Other considerations relate to decisions in the areas of purchasing, distributing, and an understanding of copyright restrictions. The selection of software requires knowledge about instructional objectives, and pedagogic considerations as well as computer capability. There are many courseware selection guides and evaluations available to teachers for this review.

A software review and purchasing policy should be set to guide purchase of instructional materials. Courseware being considered for purchase for use in the schools must be evaluated and approved for purchase by a sub-committee that reports to the district wide committee to specify guidelines for courseware and software selection. Criteria and guidelines for selection should be widely publicized and software evaluations kept on file for use by other district personnel. This activity should continue and increase over the next few years to avoid duplication of evaluation and selection of software. Additional evaluations, publications, statewide sources and national clearinghouses

will be on file in a central location and a small collection of reference materials could be established at each school. General guidelines for software and courseware can be provided through local in-service, meetings and grade-level or department discussion groups.

Building a Sequence of Topics and Activities

One of the major considerations forthcoming from the discussions with staff and administration at the Smithville Public Schools has been the integration of software and curriculum. Curriculum is the guide or set of specifications with which to implement computer technology. The ultimate curriculum adopted should include explanation of purpose, suggestions for student activities, a sequence of such activities, definition of relevant instructional materials, and evaluation strategies. To achieve a coherent and supportive curriculum using computer technology, it is necessary to have the committees assist in planning out the sequence. In earlier sections of this report, suggestions are made for the sub-committees to carry out these planning activities.

One of the most difficult questions for educators to answer is for what purpose will computers be used in the instructional process? The answer to this question will help to put all other considerations, that is hardware, software, training, etc., into their proper perspective. In the next several pages, this report suggests that a sequence of topics and activities be selected for the grade levels so that Smithville schools can begin to integrate computer literacy into the curriculum.

Grades K-2

In the early stages, all students can be provided with experiences that are designed to let students "hand-shake" with the computer. Appropriate CAI programs, drill and practice and game software, may be integrated into the regular curriculum wherever opportunities permit. Instructional tool programs such as Delta Drawing and Story Machine may be used in similar fashion to provide informal, non-threatening experiences with the computer. While no hands-on programming activities are suggested, pre-programming activities with calculators or other inexpensive electronic learning aids can be used to introduce programming ideas.

Grades 3-5

While CAI activities continue at this level with the introduction of age-appropriate simulation programs in many subject areas, tool applications, computer literacy, and programming may be the major focus of the instructional use of computers in grades 3-5.

As students develop an understanding of simple programming techniques with Delta Drawing and LOGO, problem-solving activities in subject areas will permit students to apply these newly acquired skills to relevant curriculum areas. In addition, computer literacy topics introduced at this level might include the development of a beginning computer vocabulary and initial awareness of computer-related occupations.

Grades 6-8

The major focus of computer instruction at this level is computer literacy and applications of computers with tool programs and programming to solve problems. Computer literacy will include a historical perspective of the computer as well as an awareness of career and social implications of the computer today. Programming skills in LOGO and BASIC may be developed to permit students to solve problems in a variety of contexts.

Grades 9-12

At the high school level students should recognize the potential of the computer as a powerful learning tool and as a necessary tool for survival in our technological society. Opportunities should be provided for students to have access to computers to enhance learning through appropriate CAI activities and tool applications packages. Specifically, the use of simulations in science and social studies, calculation and graphing tools in math and science, and word-processing in language and writing classes will permit students to apply computer skills to their own learning situations. Opportunities should be provided for students to develop programming skills in a variety of appropriate contexts, particularly in application to business problems and in preparation for the College Entrance Exam for Advanced Placement in Computer Science.

Figure 5, Grade Level Activities, suggests specific grade level activities that the Smithville Schools may work toward while implementing the initial three year plan.

For the K-12 curriculum to effectively provide for students to develop the knowledge, understanding, and skills essential for the computer literate citizen in this technological age, instructional activities must be articulated across all grade levels and subject areas. Figure 6, Computer Education Sequences, shows the development of major computer education topics on a continuum across all grade levels.

FIGURE 5

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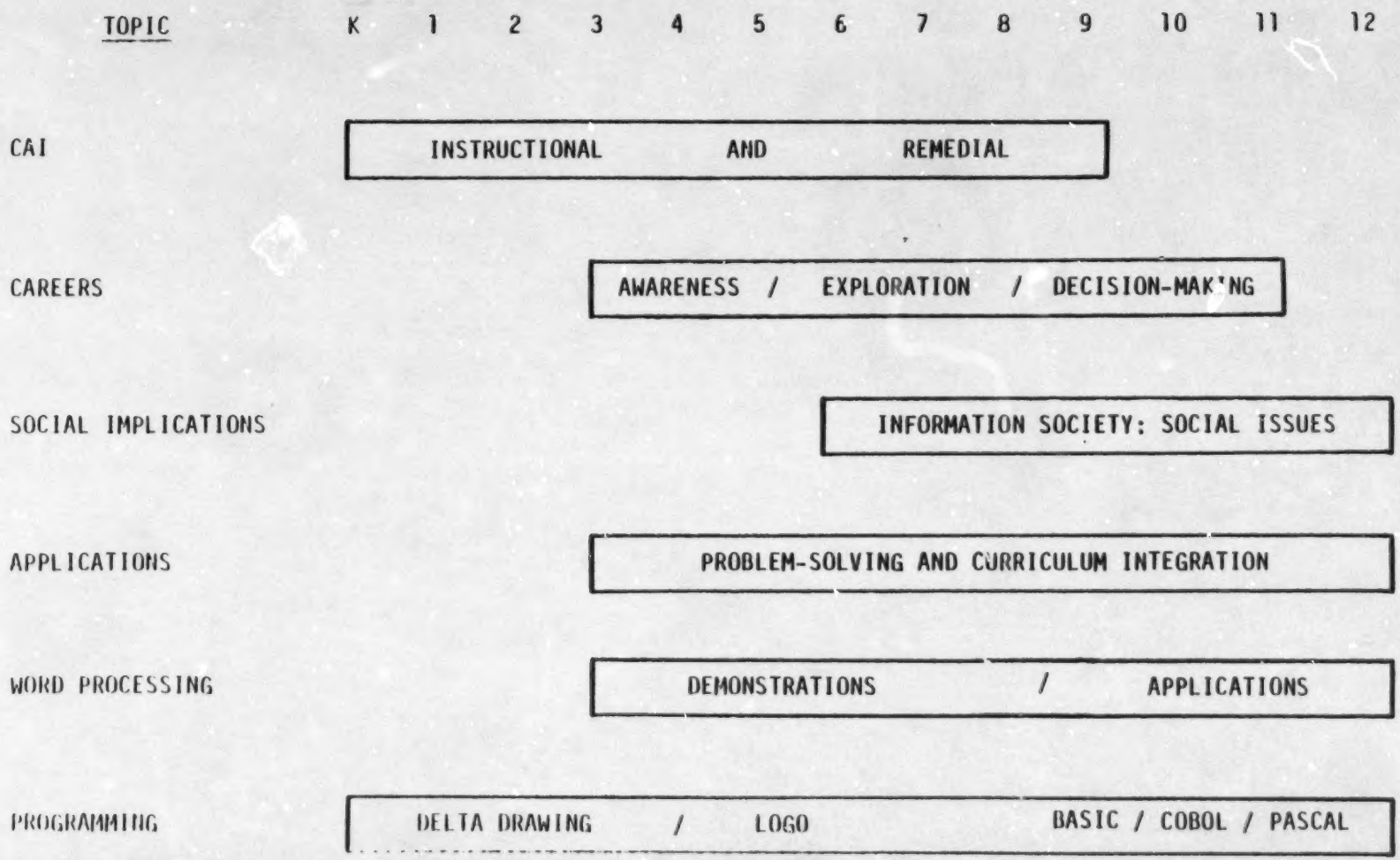
GRADE LEVEL ACTIVITIES

1983 - 1984

Activities	K - 2	3 - 5	6 - 8	9 - 12
CAI	• Drill & Practice • Games	• Drill & Practice • Games • Simulations	• Demonstrations • Drill & Practice • Tutorial • Games • Simulations	• Demonstrations • Drill & Practice (Remedial) • Tutorial (Remedial & Advanced) • Simulations Biology Chemistry Physics Social Studies
LEARNING TOOLS	• Delta Drawing • Story Machine • Juggles' Rainbow • Others		• Word Processing • Graphing • Calculations • Music, Art, etc.	• Word Processing • Graphing • Calculations • Data Bases • Music, Art, etc.
COMPUTER LITERACY		• How to Use • Vocabulary • Jobs & Careers	• History • Social Impact	• Social Issues • Career Decisions • Job Skills
PROBLEM-SOLVING		• Delta/LOGO • Programming LOGO	• Math • Science • Social Studies	• Math • Science • Business
PROGRAMMING	• Calculators • Programable Learning Aids		• LOGO • BASIC	• Introduction to BASIC • BASIC for Business Students • COBOL for Business Application • PASCAL I and II (10th, 11th, 12th) • Advanced Data Structures

FIGURE 6

COMPUTER EDUCATION SEQUENCES



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FINANCIAL CONSIDERATIONS

In Figure 7 on financial considerations, costs are outlined over a three year period. They are grouped under hardware and software in respect to grade levels. The attempt here is to develop an equitable system-wide distribution while at the same time, provide a gradual and deliberate investment and review period.

Major focus in year one is the continued purchase of hardware to complete computer laboratories at each of the schools. Smithville currently maintains a software subscription that comprises approximately 80 diskettes and supporting documents. This library should be reviewed for "best" applications in the respective schools.

The major focus of year two will be the purchase of a mini-computer at the High School and expansion of software support at all levels. The costs for the mini-computer are based upon a corporate contribution whereby 1/2 will be paid by Smithville and 1/2 requested from a corporation. Also, in year two is the establishment of a 14 station business word processing lab and at the elementary K-2 grade level the purchase of portable, low-cost computers.

In year three, hardware and software is to be now directed at the classroom and secondary school department levels. Those applications will proceed only after a review of computer laboratory installations as to

their effectiveness. Classroom applications and department locations will have a more specialized focus and it is expected that, by year three, clear specifications will be developed in these areas. Maintenance costs for the High School mini-computer need to be budgeted in year three with other costs.

Training Costs: The inservice budget should be adjusted to reflect the various levels of training necessary for the application of technology. All faculty should complete Level I training. As part of this study, MEC has trained a trainer from Smithville in the area of software selection and evaluation. This model suggests that subsequent training on software be offered locally by this trainer for the other staff in Smithville. Specialized training in such areas as PASCAL programming and the like may require attendance in regional courses.

In determining budget allotments for inservice education, Smithville should realistically plan in the next three years to increase their existing expenditures for this category.

Although we have not included cost estimates beyond year three, it is expected that hardware costs will begin to reduce while software/courseware and maintenance costs will begin to increase.

It may be necessary to give consideration at the school system level to a separate budget category in the area of computers that includes all costs--personnel, hardware, software/courseware, training, maintenance, insurance and the like.

FIGURE 7

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FINANCIAL CONSIDERATIONS

YEAR 1

	HARDWARE		SOFTWARE
	#	$	
Grades K-2	-	-	*
Grades 3-5	36	64,806	*
Middle 6-8	12	21,600	*
High School Grades 9-12	16 5	28,800 20,000	*
TOTALS		135,200	

* Currently maintains a software subscription comprising approximately 80 diskettes.

YEAR 2

	HARDWARE		SOFTWARE
	#	$	
Grades K-2	24	9,600	
Grades 3-5	-	-	10,000
Middle 6-8	6	10,800	5,000
High School Grades 9-12	mini 14 5	100,000 26,000 12,500	5,000 2,500
TOTALS		158,900	22,500

YEAR 3

	HARDWARE		SOFTWARE
	#	$	
Grades K-2	-	-	3,000
Grades 3-5	32	57,600	10,000
Middle 6-8	-	-	5,000
High School Grades 9-12	16 mini 5	28,800 18,000** 12,500	10,000
TOTALS		116,900	28,000

** Maintenance

XI

SUMMARY

Microcomputers have become the newest status symbols in American education. Computers are entering schools in record numbers and are forcing educators to rethink the teaching and learning process. Computers can bring freshness, excitement and originality into the classroom.

In this technical assistance study for the Smithville Public Schools, we are suggesting and endorsing the immediate application of computer technology at all levels of the school system. It is only through the utilization, operation and experience with computers that proper understanding and a perspective will be developed on how best to apply interactive technology to the teaching learning process.

Also, in this study we have emphasized the need for the formation of committees and sub-committees on the planning process. Other recommedations in this report establish some initial steps in the planning process as investments are being made in the areas of hardware, software and training. As beginning capacity is developed, the planning process will gather experience information on early computer implementation, and in effect determine what works and what efforts should be continued or replicated. The process suggested will also provide feedback on those applications that should not be continued. The

computer laboratories at each of the schools will provide faculty, administrators and students the necessary time and opportunity to explore a whole new set of activities that can enhance the learning process. The chart we have prepared outlines many suggested computer activities and staff and administrators are encouraged to suggest additions to this list.

As those activities are tested throughout the system, the schools will be selecting and choosing from the list those areas that will integrate into the instructional process. In essence, this formative process is a learning process and, as the knowledge and understanding of the school system grows and matures in computer technology areas, so will its ability to integrate and reflect on applications for the Smithville school system.

Our intention in this report is to recommend a series of steps that will provide initial guidance in the planning process. This process, which includes committees, staffing, training, hardware and software and courseware activities, will hopefully enable Smithville to determine over time what is "best" in computer technology applications.

APPENDIX

SMITHVILLE PUBLIC SCHOOLS
SMITHVILLE, MASSACHUSETTS

JOB DESCRIPTION

TITLE: Computer Applications Coordinator

QUALIFICATIONS:

1. A Masters degree from an accredited college or university.
2. At least three year's successful experience in computers relating to teaching and/or administration.
3. Experience in training and/or curriculum development.
4. Familiarity with state-of-the-art technology as it pertains to school applications.
5. Knowledge of appropriate resources, organizations and software resource availability.
6. Knowledge of appropriate resources, organizations and vendors relative to hardware resource availability.
7. Demonstrated success in accomplishing tasks akin to those listed below.

REPORTS TO: Assistant Superintendent of Schools

JOB GOAL: To insure the smooth and efficient operation of all computer applications including hardware, software, training and instruction for the school system. Computer application responsibilities are to be coordinated with the administrative instructional goals of the school system through the office of the Assistant Superintendent of Schools.

PERFORMANCE RESPONSIBILITIES:

1. Assumes overall support for the proper selection and application of computer hardware as it relates to the program needs in the various levels of the school system.
2. Assumes responsibility for networking of hardware capacities within the school system.
3. Assumes responsibility for the organization of teacher training programs as it relates to the application of computers in the instructional process.

PERFORMANCE RESPONSIBILITIES (CONTINUED):

4. Conducts training seminars, workshops and institutes as appropriate to the proper application of hardware and software within the school system.

5. Assist the school system in the development of a K-12 computer curriculum.

6. Provides technical assistance to special departments, i.e., business office, special education office, guidance office and the like, in the utilization of technology in administrative and other related areas.

7. Participates in system-wide computer advisory committees that are developing long-range plans for the school system.

8. Responsible for developing staffing plans for the proper support and application of technology at the various levels of the school system.

9. Responsible for developing student user groups and facilitating community usage of computer resources as appropriate.

10. Responsible for development of a system-wide software distribution plan, software exchange and selection system for the utilization of the computer software within the school system.

11. Responsible for updating computer plans and documents on a six-month basis.

TERMS OF EMPLOYMENT: Twelve-month work year.

Approved by: _____ Date: _____

Reviewed and Agreed to By: _____ Date: _____

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